TB-P_02 Soil amendment using fresh and stabilised organic materials – Effects during a wheat-maize cropping sequence

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Objectives

The main objective of this work was to study the effect of the use of a fresh organic amendment (sewage sludge) compared to a stabilized organic material (compost from animal manures) during a wheat-maize cropping sequence. For this, the effect of the treatments on the soil physico-chemical, chemical and biological properties, on GHG emissions and on the yield of the two crops studied were evaluated.

Methodology

The treatments established were the following: control soil without amendment (control), soil amended with aerobic sewage sludge (SS) and soil amended with animal waste (goat and rabbit manure) derived compost (CS). The experiment was developed in plots of 9 x 19 m2 and the treatments were applied as a single application dose of 210 kg N/ha. After the incorporation of the organic amendments, the cultivation of wheat (Triticum aestivum cv. Galera) and subsequent cultivation of maize (Zea mays var. Pioneer P1758Y) were carried out. Soil physico-chemical, chemical and biological properties, GHG emissions (CO2, CH4 and N2O) and the yields of each crop studied were determined.

Results

The incorporation of the organic amendments produced a significant increase in the concentrations of organic C, organic matter and in the different forms of N evaluated (organic and inorganic N). The C stock in the soils was incremented with the addition of the organic amendments, showing the highest increase the soil amended with compost. Khorramdel et al. (2013) also observed during maize cropping a higher C sequestration (4,1 t/ha) in low input management systems using compost and manures in a dose of 30 t/ha and hand weeding, compared to other systems of medium or high management input, in which the dose of amendment is reduced and the presence of inorganic fertilizers and field practices (tillage, etc.) is increased (0.01 t/ha in the high input management system).The application into soils of the organic amendments also enhanced the activity of the soil microbiota, increasing the rates of the soil respiration. This reactivation of the activity of the soil microorganisms was also reported in other studies using fresh and stabilized organic materials as soil amendments (Bastida et al., 2008). Also, GHG emissions varied among the different treatments and crop period, observing the highest emissions at the beginning of the wheat crop.
Concerning the crop yields, low differences were observed in the yield of wheat with the different treatments compared to the control soil; however, this fact was not observed for the maize, showing the soils amended with sewage sludge the lowest yields.

Conclusion

The incorporation of the fresh and stabilized organic amendments to the soils produced a clear increase in the soil organic matter and nitrogen contents, also producing in the short-term an improvement of the soil C pool, this effect being more notable in the soil amended with compost. Also, the different treatments only showed a clear effect on the crop yield of the second crop established.

References

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